

## CLAIMS

What is claimed is:

1. A piloted drill barrel for excavating a shaft in hard rock or other relatively hard earthen material, comprising:

5 a barrel portion comprising a downhole hammer drill disposed substantially within said barrel portion near the barrel portion's periphery for excavating a collar around a pilot shaft; and

a pilot portion axially aligned with said barrel portion and extending distally therefrom to pilot said barrel portion along said pilot shaft during excavation of a larger diameter shaft.

2. The piloted drill barrel of claim 1, wherein the pilot portion comprises an auger flight positioned to convey cuttings out of said pilot shaft.

3. The piloted drill barrel of claim 2, wherein said piloted drill barrel is open to said auger flight, thereby permitting said cuttings from said pilot shaft to be deposited within said barrel portion.

4. The piloted drill barrel of claim 3, further comprising a releasable hatch in said barrel portion at its distal end for removing cuttings deposited in said barrel portion.

5. The piloted drill barrel of claim 4, wherein said drill barrel has a diameter of at least about 36 inches.

6. The piloted drill barrel of claim 1, wherein said barrel portion is substantially open at its proximal end for receiving cuttings during operation of said piloted drill barrel.

7. The piloted drill barrel of claim 6, further comprising a releasable hatch in said barrel portion at its distal end for removing cuttings deposited in said barrel portion.

8. The piloted drill barrel of claim 7, wherein said drill barrel has a diameter of at least about 36 inches.

5 9. The piloted drill barrel of claim 1, further comprising at least one window in said barrel portion at its distal end, said window having a collecting blade extending therefrom to collect cuttings from said collar through said window during operation of the piloted drill barrel.

10. The piloted drill barrel of claim 9, further comprising a releasable hatch in said barrel portion at its distal end for removing cuttings deposited in said barrel portion.

11. The piloted drill barrel of claim 10, wherein said drill barrel has a diameter of at least about 36 inches.

12. A piloted drill barrel adapted to excavate shafts of varying diameters in hard rock or other relatively hard earthen material, comprising:

15 a barrel portion comprising a downhole hammer drill disposed substantially within said barrel portion near the barrel portion's periphery for excavating a collar around a pilot shaft;

a pilot portion axially aligned with said barrel portion and extending distally therefrom to pilot said barrel portion along said pilot shaft during excavation of a larger  
20 diameter shaft; and

a shim releasably secured to said pilot portion at its outer wall and generally

along a diameter of said piloted drill barrel intersecting said hammer drill, said shim tending to urge said piloted drill barrel out of axial alignment with said pilot shaft, thereby to excavate said collar with a different diameter that can be obtained without said shim.

5           13.    The piloted drill barrel of claim 12, wherein the pilot portion comprises an auger flight positioned to convey cuttings out of said pilot shaft.

          14.    The piloted drill barrel of claim 13, wherein said piloted drill barrel is open to said auger flight, thereby permitting said cuttings from said pilot shaft to be deposited within said barrel portion.

10           15.    The piloted drill barrel of claim 14, further comprising a releasable hatch in said barrel portion at its distal end for removing cuttings deposited in said barrel portion.

          16.    The piloted drill barrel of claim 15, wherein said drill barrel has a diameter of at least about 36 inches.

15           17.    The piloted drill barrel of claim 12, wherein said barrel portion is substantially open at its proximal end for receiving cuttings during operation of said piloted drill barrel.

          18.    The piloted drill barrel of claim 17, further comprising a releasable hatch in said barrel portion at its distal end for removing cuttings deposited in said barrel portion.

20           19.    The piloted drill barrel of claim 18, wherein said drill barrel has a diameter of at least about 36 inches.

          20.    The piloted drill barrel of claim 12, further comprising at least one window

in said barrel portion at its distal end, said window having a collecting blade extending therefrom to collect cuttings from said collar through said window during operation of the piloted drill barrel.

21. The piloted drill barrel of claim 20, further comprising a releasable hatch in  
5 said barrel portion at its distal end for removing cuttings deposited in said barrel portion.

22. The piloted drill barrel of claim 21, wherein said drill barrel has a diameter of at least about 36 inches.

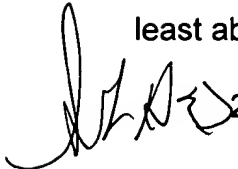
23. A drill barrel having a proximal end and a distal end for excavating a shaft in hard rock or other relatively hard earthen material, comprising:

10 a barrel portion, said barrel portion being substantially hollow and substantially open at its proximal end; and

a downhole hammer drill disposed substantially within said barrel portion near the barrel portion's periphery.

24. The drill barrel of claim 23, further comprising a releasable hatch in said  
15 barrel portion at its distal end for removing cuttings deposited in said barrel portion.

25. The drill barrel of claim 24, wherein said drill barrel has a diameter of at least about 36 inches.

 26. A method of excavating a relatively large diameter shaft in hard rock or other relatively hard earthen material, comprising the steps of:

20 excavating a pilot shaft; and

excavating a collar around said pilot shaft, said collar excavating step

comprising:

5 inserting a piloted drill barrel partially into said pilot shaft, said piloted drill barrel having (a) a barrel portion comprising a hammer drill extending distally therefrom near said barrel portion's periphery, and (b) a pilot portion in substantial axial alignment with said barrel portion and having a diameter suitable for piloting said barrel portion during excavation;

supplying pressurized air to said hammer drill, thereby to activate said hammer drill; and

rotating said piloted drill barrel with a drive mechanism.

10 27. The method of claim 26, further comprising the step of augering cuttings out of said pilot shaft with an auger flight in said pilot portion.

28. The method of claim 27, further comprising the step of collecting said cuttings within said barrel portion.

15 29. The method of claim 28, further comprising the step of removing said cuttings through a releasable hatch in said barrel portion at its distal end.

30. The method of claim 26, wherein said barrel portion is substantially open at its proximal end for receiving cuttings during operation of said piloted drill barrel.

31. The method of claim 30, further comprising the step of removing said cuttings through a releasable hatch in said barrel portion at its distal end.

20 32. The method of claim 26, further comprising the step of collecting cuttings from said collar through a window in said barrel portion at its distal end during operation

of the piloted drill barrel.

33. The method of claim 32, further comprising the step of removing said cuttings through a releasable hatch in said barrel portion at its distal end.

34. A method of excavating a relatively large diameter shaft in hard rock or other relatively hard earthen material, said shaft having more than one diameter to accommodate a casing in a portion thereof, comprising the steps of:

excavating a pilot shaft;

providing a drill barrel having (a) a barrel portion comprising a hammer drill extending distally therefrom near said barrel portion's periphery, (b) a pilot portion in substantial axial alignment with said barrel portion, and (c) a shim releasably secured to said pilot portion at its outer wall opposite said hammer drill;

inserting said pilot portion into said pilot shaft and rotating said piloted drill barrel with a drive mechanism, thereby excavating a first shaft portion having a first diameter;

placing a casing in said first shaft portion;

repositioning said shim to said pilot portion outer wall near said hammer drill;

excavating a second shaft portion having a second, smaller diameter beyond said casing by rotating said piloted drill barrel with said repositioned shim.

35. The method of claim 34, further comprising the step of augering cuttings out of said pilot shaft with an auger flight in said pilot portion.

36. The method of claim 35, further comprising the step of collecting said cuttings within said barrel portion.

37. The method of claim 36, further comprising the step of removing said cuttings through a releasable hatch in said barrel portion at its distal end.

38. The method of claim 34, wherein said barrel portion is substantially open at its proximal end for receiving cuttings during operation of said piloted drill barrel.

5 39. The method of claim 38, further comprising the step of removing said cuttings through a releasable hatch in said barrel portion at its distal end.

40. The method of claim 34, further comprising the step of collecting cuttings through a window in said barrel portion at its distal end during operation of the piloted drill barrel.

10 41. The method of claim 40, further comprising the step of removing said cuttings through a releasable hatch in said barrel portion at its distal end.